METHOD AND APPARATUS FOR PROVIDING A MENU STRUCTURE FOR AN INTERACTIVE INFORMATION DISTRIBUTION SYSTEM

5   CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a divisional of co-pending U.S. patent application Serial No. 08/984,427, filed December 3, 1997, and assigned to the same assignee as this application, which co-pending application claims benefit of U.S. provisional patent
10   application serial number 60/034,490, filed January 13, 1997; the disclosures of U.S. provisional application Serial No. 60/034,490, filed January 13, 1997, and U.S. patent application Serial No. 08/984,427, filed December 3, 1997, are herein incorporated by reference.

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BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an interactive information
20   distribution system such as a video-on-demand (VOD) system.
More particularly, the present invention relates to a method and apparatus for providing an interactive menu structure, i.e., an on-screen program guide, for such an interactive information distribution system.

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2. Description of the Background Art

Recent advances in digital signal processing techniques, and in particular, improvements in digital compression
30   techniques, have led to a plethora of proposals for providing new digital services to a customer's home via existing telephone and coaxial cable networks. For example, it has been proposed to provide hundreds of cable television channels to subscribers by compressing digital data, digital video, transmitting
35   compressed digital video over conventional coaxial cable

television channels, and then decompressing the video in the
subscriber's set top terminal. Another proposed application for
this technology is a video-on-demand system in which a
subscriber communicates directly with a video service provider

5 via telephone lines to request a video program from a video
library and the requested video program is routed to the
subscriber's home via telephone lines or via coaxial cable
television cables for immediate viewing. Other proposed video-
on-demand systems use a frequency multiplexing technique to

10 enable control information for a set top terminal to be
transmitted through a cable network back to an information
server. Such a system permits bi-directional communication over
a single network.

     In each of these information distribution systems, menus

15 are displayed upon the subscriber's television and using a
remote control device, a subscriber selects a desired program
for viewing. A program code is then sent from the set top
terminal through the communication system back to the service
provider. The selected program is then recalled from memory by

20 the service provider equipment and broadcast to the set top
terminal that requested that information. Alternatively, the
subscriber may telephone the service provider and request
certain information that is displayed in a menu upon the
subscriber's television or the subscriber's set top terminal or

25 television set may automatically tune, in response to the menu
selection, to a broadcast channel to receive information
transmitted on that channel. In any event, the currently
available systems generally do not provide an interactive menu
structure through which to select programming. Usually the

30 menus are rudimentary text listings of available programs. By
scrolling through the lists of programs using a remote control
device the user selects desired programming. These text-based
menus do not contain any graphics, video, or other material that
would provide an entertaining interactive session. Two such

systems are disclosed in U.S. patents 5,357,276 issued October 18, 1994 and 5,477,262 issued December 19, 1995.

Therefore, there is a need in the art for a method and apparatus for providing an improved interactive menu structure for an interactive information distribution system.

SUMMARY OF THE INVENTION

The disadvantages heretofore associated with the prior art are overcome by the present invention of a method and apparatus for providing an improved interactive menu structure for an on-screen program guide within an interactive information distribution system. The invention is embodied in a combination of software, which provides a so-called "navigator," and hardware, including a set top terminal that provides certain functionality for the navigator and a video session manager which supports the functionality of the set top terminal. As such, the navigator functions are distributed between service provider equipment (video session manager) and subscriber equipment (set top terminal). Such distribution provides an enjoyable, real-time interactive session that allows the subscriber to rapidly navigate through a plethora of menus to find particular information, which the subscriber desires to view.

More specifically, the interactive information distribution system comprises service provider equipment connected to subscriber equipment through a communications network. The service provider equipment includes an information server coupled to a video session manager. The video session manager contains a modulator for modulating information provided by the server into a form that can be transmitted through the network to the subscriber equipment. The video session manager also contains a modem for communicating command and control

information between the service provider equipment and
subscriber equipment.

The subscriber equipment includes a set top terminal that
is connected to a display device such as a television and an
5   input device such as an infrared (IR) or radio-frequency (RF)
remote control. The user while viewing the display device may
select a number of menus using the input device as the menus are
presented from the set top terminal upon the television screen.
Any commands which the user transmits to the set top terminal
10   that are not handled by the set top terminal itself are
communicated through the network to the service provider
equipment, demodulated by the modem and implemented by the video
session manager. The video session manager forms an interface
between the modem and the server such that the video session
15   manager may coordinate billing, ensure that proper programming
is sent through the network and addressed properly to the set
top terminal requesting that programming, and interact with the
server.

A navigator menu structure is a series of interconnected
20   "applets" (e.g., a linked list of programs). Each applet
contains certain data for producing interactive menu imagery
(screen) as well as control instructions that provide
functionality for the menu. The applet data generally contains
two components. There are the underlying video images
25   (background video) which provides so-called entertaining "eye
candy" and selectable icons for the viewer. Additionally, there
is an overlay screen, which provides the interactive
functionality and command structure for the navigator. The
overlay screen is produced using the on-screen display (OSD)
30   functions of a video decoder within the set top terminal.
Particular applets are sent through the network to the set top
terminal in response to a particular command from the
subscriber.

Specifically, when a subscriber selects a functional icon
within a given menu, an applet for a new menu corresponding to
the selected icon is downloaded from the server through the
modem and the network to the set top terminal. The applet is
5   contained in a compressed, packetized video stream. This stream
conforms to the compression and transport protocols of a
standard video transmission protocol such as the Moving Pictures
Experts Group (MPEG) protocol.

As soon as the background video associated with the applet
10 is available for display, the video decoder displays the video
on the television screen. Additionally, the OSD overlay(s) are
displayed "over" the background video. These OSD graphics
facilitate certain interactive functions such that when the user
manipulates a joystick or other selection instrument particular
15 regions are visibly altered, e.g., the regions become
highlighted. The user then selects a highlighted region for
implementation of a function represented by the highlighted
region. The region generally changes in some manner indicating
that that graphic has been selected. The display of the
20 overlays is handled by a microprocessor within the set top
terminal as well as an on-screen display graphics processor
within the video decoder of the set top terminal. Selecting a
region or icon on the screen will send a command to the video
session manager for implementation. In response, the video
25 session manager sends a new applet representing another menu
(e.g., the next applet in the linked list) or a multimedia
selection such as a movie.

The navigator menu structure may be conveniently described
in terms of a video layer, a graphics layer and a control layer.
30 The video layer comprises the displayed video images produced
using, e.g., information contained in an applet. The graphics
layer comprises OSD overlay(s) including graphical objects which
are associated with applets stored in either subscriber or
provider equipment. The OSD overlay(s) are displayed over the

video layer. As such, the OSD layer can be used to emphasize and de-emphasize the underlying video. In particular, the graphics can be transparent (or have some level of transparency) to allow much of the underlying video to be seen while
5 positioning certain graphics upon the video, and/or the OSD graphics can be opaque such that, by turning the graphics on and off the underlying video is either masked or revealed. The control layer comprises a command processing and logical operations layer. The control layer retrieves the applets
10 associated with graphic layer objects selected by a user, executes the applets, provides video information to the video layer and objects information to the graphics layer.

BRIEF DESCRIPTION OF THE DRAWINGS
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The teachings of the present invention can be readily understood by considering the following detailed description in conjunction with the accompanying drawings, in which:
FIG. 1 depicts a high level block diagram of an interactive
20 information distribution system containing the present invention;
FIG. 2 depicts a block diagram of an illustrative set top terminal within the system of FIG. 1;
FIG. 3 depicts an illustrative "compass" menu display;
25 FIG. 4 depicts a second illustrative "list" menu display containing a text list of selections;
FIG. 5 depicts a schematic illustration of the content of an applet;
FIG. 6 depicts the appropriate alignment of FIGS. 6A and
30 6B;
FIGS. 6A and 6B, taken together, depict a flow diagram of an applet transmission and execution routine;
FIG. 7 depicts a flow diagram of list information processing routine;

FIG. 8 depicts a flow process for retrieving and transmitting an applet;

FIG. 9 depicts a help menu;

FIG. 10 depicts a "compass" menu;

5   FIG. 11 depicts a movie information screen;

FIG. 12 depicts preview screen;

FIG. 13 depicts a guarantee screen;

FIG. 14 depicts a set up screen;

FIG. 15 depicts a set up menu;

10   FIG. 16 depicts a account summary;

FIG. 17 depicts an active programs screen;

FIG. 18 depicts a TV set up menu; and

FIG. 19 depicts a list menu.

To facilitate understanding, identical reference numerals
15 have been used, where possible, to designate identical elements
that are common to the figures.

DETAILED DESCRIPTION

20   The invention is a method and apparatus that provides an
improved interactive menu structure for an on-screen program
guide for use with an information distribution system. The
inventive menu structure shall hereinafter be referred to as a
"navigator". Although the navigator of the present invention
25 can be implemented and executed using a number of different
types of information distribution system, the preferred
embodiment is used in combination with the hardware described
below. The interactive information distribution system
described below is disclosed in detail in United States
30 provisional patent application 60/034,489 filed January 13, 1997
and incorporated herein by reference. However, this specific
hardware arrangement is considered illustrative of the type of
system with which the invention is used. Any other hardware

arrangement that facilitates information distribution is
considered within the scope of the invention.

FIG. 1 depicts a high level block diagram of the
illustrative information distribution system 100 that
5   incorporates the present invention.   The system contains service
provider equipment 102, a communications network 104 and
subscriber equipment 106_n, where n is an integer greater than
zero.   The service provider equipment 102 contains an
information server 108 which is typically a parallel processing
10   computer containing at least one central processing unit 110 and
associated memory 112.   The server interacts with a data storage
device 114 (e.g., a disk drive array) that generally stores the
subscriber information (e.g., video data) that will be recalled
and downloaded to the subscriber.   Additionally, within the
15   service provider equipment is a video session manager 122 that
provides session control of the information flowing to and from
the server.   Furthermore, the video session manager 122 contains
its own central processing unit 124 and associated memory 126.

The information server 108 is coupled to the video session
20   manager via data path 116, synchronization clock path 118 and
control path 120.   The server 108 provides data streams on path
116 and a synchronization clock on path 118 in response to
requests for information from the video session manager on
path 120.   These data streams are packetized and modulated onto
25   a carrier that is compatible with the transmission requirements
of the network 104.

The video session manager 122 accomplishes all of the
transmission interface requirements of the system 100.
Specifically, the video session manager 122 is coupled to
30   subscriber equipment via a forward information channel 132, a
forward command channel 133 and a back channel 134.   All three
of these channels are supported by the cable transport network.
The video session manager contains a modulator for modulating
the server data streams onto one or more carrier frequencies for

transmission on the forward information channel. Additionally, the video session manager contains a modem for sending control information via the forward command channel and receiving control information via the back channel. Moreover, a

5   conventional cable television signal source 128 is optionally coupled to the forward information channel via a signal coupler 130.

The network 104 can be any one of a number of conventional broadband communications networks that are available such as a

10   fiber optic network, a telephone network, existing cable television network and the like. For example, if the network is a hybrid fiber-coax network, the transmission transport technique used in both forward channels may be modeled after the Moving Pictures Expert Group (MPEG) transport protocol for the

15   transmission of video data streams. In general, the transport mechanism for both of the forward channels that transport information to the set top terminal must be able to carry unidirectional, asynchronous packetized data such as that defined in the MPEG video and audio signal transmission

20   protocol, and the like. There are a number of such transport protocols available.

Each set top terminal 106 receives the data streams from the forward information channel, demodulates those streams and processes them for display on the display device 140 (e.g., a

25   conventional television). In addition, the set top terminal 106 accepts commands from a remote control input device 138 or other input device. These commands are formatted, compressed, modulated, and transmitted through the network 104 to the video session manager 122. Typically, this transmission is

30   accomplished through the back channel 134. These commands are preferably transmitted through the same network used to transmit information to the set top terminal. However, the back channel coupling the set top terminal to the server may be a separate network, e.g., a forward information channel through a

television cable network and a back channel through a telephone network. The telephone network could also support the forward control channel. The video session manager 122 interprets each command sent from the set top terminal through the back channel

5   and instructs the information server to perform certain functions to implement the subscriber request.

FIG. 2 depicts a block diagram of the set top terminal 136 which contains a transceiver 200, a central processing unit (CPU) 212 and a display driver 222. Of course, the

10 functionality of the set top terminal 136 can be embedded within a single consumer electronics product such a television. As such, the description of a stand-alone set top terminal should be considered illustrative of the type of subscriber equipment that may be used to implement the present invention. Within the

15 set top terminal 136, the CPU 212 is supported by random access memory (RAM) 220, read only memory (ROM) 218 and various support circuits 216 such as clocks, power supply, an infrared receiver and the like. The transceiver 200 contains a diplexer 202, a back channel transmitter 208, an information channel receiver

20 204, a command channel receiver 210, an information decoder 206, a conventional television signal receiver 224, and a multiplexer 226. The diplexer 202 couples the three channels carried by a single cable within the network to the transmitter and receivers.

25   Each receiver 204 and 210 contains a tuner, amplifiers, filters, a demodulator, and a depacketizer. As such, the receivers tune, downconvert, and depacketize the signals from the cable network in a conventional manner. The information channel receiver 204 contains a conventional QAM demodulator

30 such as a model BCM3115 manufactured by the Broadcom Corporation. Other such demodulators are well-known in the communications arts and could be used in this application. However, this particular QAM demodulator also contains a built in "out-of-band" QPSK demodulator for handling command channel

data carried by the forward command channel. As such, a single integrated circuit demodulates both subscriber requested information (audio and video) as well as command data.

The decoder 206 processes the data packets carrying
5   subscriber requested information produced by the QAM demodulator into useable signals for the end user display, e.g., television, home studio, video recorder and the like. The decoder is coupled to a dynamic random access memory (DRAM) to facilitate decoding of the data packets and processing of applets, as shall
10   be discussed below. The signals for display are conventionally processed by a display driver 222 to produce composite video as well as a conventional television signal, e.g., modulated onto channel 3 or 4 using the NTSC standard modulation.

The conventional cable television signal receiver 224
15   contains a tuner and an analog (NTSC) demodulator. A multiplexer 226 couples the demodulated analog or decoded video signal to the display drive 222. Of course, the NTSC demodulator can be replaced with a PAL or SECAM standard demodulator, as needed.
20   The demodulated QPSK signal provides command and control information to the CPU 212 for generating certain graphics and control interface regions upon a television screen. The CPU is, for example, a Model 68302 processor manufactured by Motorola. This processor, operating in combination with the decoder 206 as
25   well as a continuously available video signal from the information channel, produces screen displayed buttons, icons and graphical regions with which a subscriber interacts using the remote control. Without the video signal the set top terminal does not produce any display, i.e., the displays are
30   actively generated in real time as needed to facilitate certain navigation functions.

Specifically, a joystick on the remote control selectively highlights certain pre-defined regions of the television screen. To perform such highlighting, a reference region is always

highlighted when a menu is first displayed. From that reference region, direction vectors produced by the joystick are interpreted by the CPU to highlight a region lying in the direction in which the joystick was moved. When a desired
5 selectable icon is highlighted, the subscriber depresses a "select" key on the remote that sends an infrared signal to an infrared receiver (a support circuit 216). This receiver sends the select command to the CPU for interpretation. The selected region is associated with a function. If the function is a
10 request for specific information or a change in the menu, the processor formats the command and sends it to the back channel transmitter for transmission to the video session manager. If the command is a function that is handled locally such as volume control, the CPU implements the function within the set top
15 terminal.

Since the session control commands are implemented by the video session manager and not the set top terminal alone, the number of available session control commands is infinite. Each command is implemented by the execution of an applet, as
20 described below. The applets control both information sessions, e.g., the presentation of video to the television screen, and navigator functions, e.g., the menus that facilitate selection of a video program. As such, particular commands include, but are not limited to, information or menu navigation commands,
25 movie start at beginning, movie start at the middle, play, stop, rewind, forward, pause, and the like. These presentation and navigation control commands are sent via a back channel transmitter 208 using binary phase shift key (BPSK) modulation. Additionally, the CPU in the set top terminal implements certain
30 local commands such as increment or decrement the volume, channel change, and on/off.

The invention is implemented as one or more interrelated "applets" which, when taken together, form the navigator of the present invention. The applets are transmitted, for the most

part, to the set top terminal via the forward information
channel. Certain information used by particular applets is
transmitted to the set top terminal via a data stream propagated
through the forward command channel. As such, the data stream
5   carrying the applet is demodulated, the applet extracted and the
applet's information decoded prior to execution that displays a
menu on the display device. The detailed process by which an
applet is downloaded and used to produce a menu is disclosed
with respect to FIGS. 6 and 7 below.

10   FIG. 3 and 10 depict illustrative menu imagery (a "compass"
menu screen 300) used to select movies available from the
information distribution system. All the information, as well
as control instructions, to produce such a menu is contained in
an applet downloaded from the service provider equipment. As
15   such, the service provider equipment stores the applets in
server memory such that each applet can be rapidly recalled and
routed to a set top terminal for display.

        The illustrated menu screen 300 contains background
video 302 that contains the menu structure. The background
20   video also produces the text and other fixed graphics, e.g., the
compass 304. An overlay or foreground video of typically
transparent on-screen display (OSD) bitmap graphics 306 (shown
in phantom proximate each user selectable graphic or icon) is
positioned atop the background video 302. Typically, one region
25   of the foreground video is highlighted to identify the present
selectable menu region or icon. As shall be described below,
these OSD graphics are produced and controlled by the OSD
graphics processor within the video decoder in the set top
terminal.

30   The background video comprises a video layer, while the
overlay or foreground video comprises a graphics layer. The
generation of both the video layer and graphics layer is
controlled by a control layer. Briefly, the video layer
comprises displayed video images produced using, e.g.,

information contained in an applet. The graphics layer
comprises OSD overlay(s) including graphical objects that are
associated with applets stored in either subscriber or provider
equipment. The OSD overlay(s) are displayed over the video
5   layer. The control layer comprises a command processing and
logical operations layer. The control layer retrieves the
applets associated with graphic layer objects selected by a
user, executes the applets, and provides video information to
the video layer and object information to the graphics layer.
10   The applet may also carry audio information that would
"play" when a particular event occurred or specific menu object
selected. Additionally, an animation object could be carried in
the applet to allow certain objects to become animated when
selected.
15   Generally, when a user selects a particular icon, the
graphic object in the overlay plane is altered to de-emphasize
or emphasize the icon or the video underlying the graphic
object. In other words, the object is altered from one state to
another state to facilitate the emphasis/de-emphasis of a
20   particular region of the menu.
          In one embodiment of the invention, when a user selects a
highlighted icon, the OSD graphic proximate that icon is
immediately altered to acknowledge the selection. The
alteration is typically a change of color of the transparent
25   overlay such that the icon "glows". To effectuate this OSD
alteration, each menu field represented by the region is defined
by a pair of linked lists. One pair of linked lists in the menu
is always active, i.e., there is always some region of the
screen that is highlighted.
30   Alternatively, the OSD graphics may produce an opaque
overlay that is made transparent (or partially transparent) when
the region containing the overlay, or some other region, is
selected. As such, the underlying video that lies beneath the
overlay is revealed. Such a mask and reveal process enables the

video to contain regions of imagery that are revealed upon
selection, where these regions provide the user with
recognizable and enjoyable information generally relating to the
selection that was made or generally providing an enjoyable

5 transition to the next screen. Furthermore, the mask and reveal
process can be used to periodically mask and reveal certain
imagery without the subscriber selecting any regions. This
function may be used to merely provide a graphical enhancement
to the display, i.e., emphasis and de-emphasis of particular

10 menu regions.

The applet logic responds to the user commands entered
through the remote control by activating different linked lists
(i.e., moving a starting link pointer), or by adding, removing,
or changing the mix of regions in the active list. The applet

15 logic also tells the CPU which command sequence terminates the
applet and which response to send to the video session manager.
The applet logic contains a table of command sequences that are
identified with specific coordinates defining the field
locations on the menu.

20 The function of the navigator is generated through the use
of Navigator descriptor files. These files are used as the
basis for construction of all navigator applet screens. A
navigator descriptor file defines specific objects (e.g.,
graphical bitmap, audio, animation and the like) to be used,

25 their physical location on the navigator menu screen, and their
interactions with the subscriber's remote control actions. The
navigator asset builder software program uses the navigator
descriptor files to generate the final pseudo MPEG bitstream
that is sent to the set top terminal. The asset builder reads

30 the objects as defined by the navigator asset builder and
combines them with the appropriate control information also
contained in the navigator descriptor files.

The navigator descriptor files are written in an HTML like
language syntax specifically designed for this application.

Each definition type starts with an angle bracket "<"
immediately preceding the definition name. The definition type
ends with an angle bracket, a forward slash "</" and then the
definition name. Definitions can be nested. The navigator
5   description file for building an applet having bitmap objects
includes the following type definitions:

REGION: Lists all of the bitmaps that reside within an
          individual region on the screen, their specific
10   locations within the region, and palette specific
          information for each bitmap.
PALETTE: Defines a palette of one or more colors.
BUTTON: Defines a control that appears as one or more
          previously defined bitmaps on the subscriber's
15   television and can cause actions to take place
          (primarily messages sent upstream) when the
          subscriber presses the SELECT button on the remote
          control while the button is highlighted.
LIST: Defines a control that consists of one or more
20   bitmaps (usually a rectangular region of constant
          color) that is overwritten with TEXT sent from the
          upstream process and rasterized onto the region.
          Generally the text remains visible and the
          background colors change per subscriber selection.
25   STATIC: Defines a control that consists of one bitmap
          (usually a rectangular region of constant color)
          into which upstream text is rastorize and made
          visible no matter what the subscriber selects with
          the remote control.
30   EDIT: Defines a control that consists of one bitmap
          (usually a rectangular region of constant color)
          into which user entered text (as in numbers from
          the remote control are rasterized. The text
          generally remains visible for that entire applet.

The background color changes as the subscriber
selects or unselects the edit region. Edit
controls also can exhibit the behavior that
require a predefined number of characters to be

5 entered by the subscriber through the remote
control before any other buttons or controls can
be actuated.

ACTION: Messages that are formatted and sent upstream via
the back channel when the subscriber presses the

10 SELECT button while the corresponding ACTION
control is highlighted.

For example, a Navigator Descriptor File for a List Screen (LAZ)
such as that which appears in FIG. 19 and whose operation is

15 discussed with respect to FIG. 7 is structured as follows:

```
<SCREEN name=LAZ>

############## Define Regions #######################
<REGION MIX=3>
        <BMP NAME=UpLevelInfo FILE=/ms/bmp/up_mme~2 X=88
        Y=398 BG=0>
</REGION>
        <BMP NAME=UpInfo FILE=/ms/bmp/listup~2 X=88
        Y=398 BG=0>
</REGION>
<REGION MIX =3>
        <BMP NAME=Chop FILE=/dv/chopstr X=555 Y=394
        BG=14>
        <BMP NAME=ChopInfo FILE=/ms/bmp/chop_m~2 X=88
        Y=398 BG=0>
</REGION>
</REGION MIX=2>
        <BMP NAME=Up FILE=/ms/bmp/list~1 X=287 Y=166
        BG=0>
        <BMP NAME=line1 FILE=dv/line X=163 Y=205 BG=1>
        <BMP NAME=line2 FILE=/dv/line X=163 Y=236 BG=1>
        <BMP NAME=line3 FILE=/dv/line X=163 Y=267 BG=1>
</REGION>
</REGION MIX=2>
        <BMP NAME=line4 FILE=/dv/line X=163 Y=298 BG=1>
</REGION>
</REGION MIX=2>
        <BMP NAME=line5 FILE=/dv/line X=163 Y=329 BG=1>
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                    <BMP NAME=line6 FILE=/dv/line X=163 Y=360 BG=1>
                    <BMP NAME=ChopTop FILE=/dv/chopsttp X=555 Y=355
                    BG=14>
            </REGION>
     5      <REGION>


                    <BMP NAME=AEInfor FILE=/ms/bmp/list_a~1 X=88
                    Y=392 BG=0>
    10      </REGION>
            <REGION>
                    <BMP NAME=FJInfo FILE=/ms/bmp/list_f~1 X=88
                    Y=392 BG=0>
            </REGION>
    15      <REGION>
                    <BMP NAME=KOInfo FILE=/ms/bmp/list_k~1 X=88
                    Y=392 BG=0>
            </REGION>
            <REGION>
    20              <BMP NAME=PTInfo FILE=/ms/bmp/list_p~1 X=88
                    Y=392 BG=0>
            </REGION>
            <REGION>
                    <BMP NAME=UZInfo FILE=/ms/bmp/list_u~2 X=88
    25              Y=392 BG=0>
            </REGION>
            <REGION>
                    <BMP NAME=Down FILE=/ms/bmp/list_d~12 X=286
                    Y=388 BG=0>
    30              <BMP NAME=DownInfo FILE=/ms/bmp/list_d~2 X=88
                    Y=392 BG=0>
            </REGION>
            </REGION MIX=6>
                    <BMP NAME=SAUSAGE FILE=/dv/sausage BG=14 X=178
    35              Y=53>
                    <BMP NAME=AE FILE=/dv/ae BG=14 X=178 Y=53>
                    <BMP NAME=FJ FILE=/dv/fj BG=14 X=178 Y=53>
                    <BMP NAME=KO FILE=/dv/ko BG=14 X=178 Y=53>
                    <BMP NAME=PT FILE=/dv/pt BG=14 X=178 Y=53>
    40              <BMP NAME=UZ FILE=/dv/uz BG=14 X=178 Y=53>
            </REGION>
            </REGION MIX=3>
                    <BMP NAME=Help FILE=/ms/bmp helpst~1 X=555 Y=8
                    BG=2>
    45      </REGION>
            <REGION>
                    <BMP NAME=HelpInfo FILE=/ms/bmp/help_9~1 X=88
                    Y=392 BG=0>
            </REGION>
    50      <REGION>
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                       <BMP NAME=ListInfo FILE=/ms/bmp/list_t~1 X=88
                       Y=398 BG=0>
               </REGION>
               <REGION>
5                      <BMP NAME=UpLevel FILE=/ms/bmp/up_mme~1 X=274
                       Y=24 BG=0>

           ############# Define Special Palettes #############

10     <PALETTE NAME=off>
               <RGB 0 150 150 TRANSPARENT>
               <RGB 0 0 0>
       </PALETTE>
       <PALETTE NAME=active>
15             <RGB 0 255 179>
               <RGB 0 0 0>
       </PALETTE>
       </PALETTE NAME=BON>
               <RGB 255 255 255 TRANSPARENT>
20     </PALETTE>
       <PALETTE name=HighLite>
               <RGB 0 255 179>
               <RGB 0 0 0>
       </PALETTE>
25
           ################ Define Controls ##############

       <LISTBOX NAME=listbox ON=active OFF=off SEL-LISTSEL
       FONT=0>
30             <GOTO N=Up S=Down>
               <GOTO E=Chop>
               <TAB TYPE=CENTER STOP=188>
               <TAB TYPE=LEFT STOP=188>
               <ENTRY ASC=line1>
35             <ENTRY ASC=line2>
               <ENTRY ASC=line3>
               <ENTRY ASC=line4>
               <ENTRY ASC=line5>
               <ENTRY ASC=line6>
40             <FOCUS ASC=ListInfo ON=ListInfo>
               <ACTION MSG=SELECT>
                   <FADE>
                   <SENDSTRINGS LISTSEL>
               </ACTION>
45     </LISTBOX>
       <BUTTON NAME=DOWN>
               <FOCUS ASC=Down ON=Down>
               <FOCUS ASC=DownInfo ON=DownInfo>
               <GOTO N=listbox E=Chop>
50             <ACTION MSG=SELECT>
                   <PGDOWN LIST=listbox>
```

```
                        </ACTION>
                </BUTTON>
                <BUTTON NAME=Up>
                        <FOCUS ASC=Up ON=Up>
 5                      <FOCUS ASC=UpInfo ON=UpInfo>
                        <GOTO S=listbox N=KO>
                        <ACTION MSG=SELECT>
                                <PGUP LIST=listbox>
                        </ACTION>
10              </BUTTON>
                <BUTTON NAME=UpLevel>
                        <FOCUS ASC=UpLevel ON=UpLevel>
                        <FOCUS ASC=UpLevelInfo ON=UpLevelInfo>
                        <GOTO S=KO E=Help>
15                      <ACTION MSG=SELECT>
                                <FADE>
                                <TRANSITION DIR=U>
                        </ACTION>
                </BUTTON>
20              </BUTTON NAME=AE>
                        <FOCUS ASC=SAUSAGE ON=BON>
                        <FOCUS ASC=AE ON=HighLite>
                        <FOCUS ASC=AEInfo ON=AEInfo>
                        <GOTO S=Up E=FJ N=UpLevel>
25                      <ACTION MSG=SELECT>
                                <SENDSTRINGS AE>
                        </ACTION>
                </BUTTON>
                <BUTTON NAME=FJ>
30                      <FOCUS ASC=SAUSAGE ON=BON>
                        <FOCUS ASC=FJ ON=HighLite>
                        <FOCUS ASC=FJInfo ON=FJInfo>
                        <GOTO S=Up E=KO W=AE N=UpLevel>
                        <ACTION MSG=SELECT>
35                              <SENDSTRINGS FJ>
                        </ACTION>
                </BUTTON>
                <BUTTON NAME=KO>
                        <FOCUS ASC=SAUSAGE ON=BON>
40                      <FOCUS ASC=KO ON=HighLite>
                        <FOCUS ASC=KOInfo ON=KOInfo>
                        <GOTO S=Up E=PT W=FJ N=UpLevel>
                        <ACTION MSG=SELECT>
                                <SENDSTRINGS KO>
45                      </ACTION>
                </BUTTON>
                <BUTTON NAME=PT>
                        <FOCUS ASC=SAUSAGE ON=BON>
                        <FOCUS ASC=PT ON=HighLite>
50                      <FOCUS ASC=PTInfo ON=PTInfo>
                        <GOTO S=Up E=UZ W=KO N=UpLevel>
```

```
                    <ACTION MSG=SELECT>
                         <SENDSTRINGS PT>
                    </ACTION>
          </BUTTON>
5         <BUTTON NAME=UZ>
                    <FOCUS ASC=SAUSAGE ON=BON>
                    <FOCUS ASC=UZ ON=HighLite>
                    <FOCUS ASC=UZInfo ON=UZInfo>
                    <GOTO S=Up W=PT E=Help N=UpLevel>
10                  <ACTION MSG=SELECT>
                         <SENDSTRINGS UZ>
                    </ACTION>
          </BUTTON>
          <BUTTON NAME=Help>
15                  <FOCUS ASC=Help ON=Help>
                    <FOCUS ASC=HelpInfo ON=HelpInfo>
                    <GOTO W=UZ>
                    <GOTO S=Chop>
                    <ACTION MSG=SELECT>
20                       <FADE>
                         <TRANSITION DST=HLS DIR=D>
                    </ACTION>
          </BUTTON>
          <BUTTON NAME=Chop>
25                  <FOCUS Chop ASC=Chop ON=Chop>
                    <FOCUS ChopInfo ASC=ChopInfo ON=ChopInfo>
                    <FOCUS ChopTop ASC=ChopTop ON=ChopTop>
                    <GOTO W=Down>
                    <GOTO N=Help>
30                  <ACTION MSG=SELECT>
                         <FADE>
                         <TRANSITION DST=MME DIR=J>
                    </ACTION>
          </BUTTON>
35  </SCREEN>
```

        As shown in FIG. 8, an address (region ID) identifying the
selected region is transmitted to the video session manager.
The video session manager concatenates the region address with
40 an address of the applet within which the region selection was
made. The concatenated address is used to identify an entry (an
applet ID) in an applet table. This applet ID indicates the
applet that is to be sent to fulfill the subscriber's request.
The AID may also identify a movie or other multimedia
45 information that is to be transmitted. The specific applet
routine identified by the applet ID is recalled from memory and

forwarded to the set top terminal for execution. The set top
terminal then performs a function identified by the applet,
e.g., decode the signals with assets (applet decoding), decode
signals without assets (decode applet without any controls

5   except return), decode movie from beginning, or decode movie
from middle. As such, the set top terminal does not perform any
high level functions, the terminal, in most instances, merely
functions as a video decoder and command interpreter.

Returning to FIG. 3 and 10, each menu is linked to other

10   menus as a linked list such that selection of a particular icon
results in another applet being downloaded and another menu
being generated. In addition to textual icons, the menu 300
contains a "compass" 304. This compass forms a "spatial
mnemonic" through which a subscriber navigates through the

15   various menu screens. For example, the east and west arrows
(310 and 312) link to menus that are conceptually lateral to the
present menu. Such menus that are lateral to, for example, the
movie explorer menu 300 are new movie promotional clips and a
special interest list menu. The north arrow 314 links to a

20   previous menu. The south arrow is generally non-functional in
the particular menu shown. Other icons on the menu 300 include
a help icon 318 and a current highlighted region description
area 320. As such, area 320 provides a short description of the
presently highlighted region, e.g., the explanation of "Movies

25   A-Z" is shown. Selecting region 324 executes an applet that
produces a "list menu", as described with respect to FIG. 4 and
19 below. Other icons link to short multimedia "clips". For
example, the "Coming Soon" icon 322 links to a series of
promotional clips or graphics that advertise movies that will

30   soon be available. The "On Set" icon 316, when selected, leads
back to the initial menu into the navigator or some other high
level point in the navigator tree. The "On Set" icon appears on
every menu to provide an direct link to a higher level of the
navigator from any menu.

For example, selecting the "Movies A-Z" textual icon 324 links to an alphabetical menu (see menu 400 of FIG. 4 and 19) that presents an alphabetical list 402 of all the available movies. The arcuate menu region 404 contains a plurality of alphabetic ranged segments 406_n (where n is an integer value) that, when selected, presents a menu list containing the movie titles in the selected alphabetic range. The subscriber can then scroll through the alphabetical list 402 using the up arrow icon 402 to move to a previous page of movies and the down arrow 408 to move to a following page. Manipulating the joystick will sequentially highlight the movie titles until a desired title is highlighted. Selecting a name of a movie causes that movie to be sent to the set top terminal for presentation. The left and right arrows 410 and 412 move to similar lists in parallel menus, e.g., moving from an alphabetical list of comedies may move to an alphabetical list of dramas and so on. When an arrow (or any icon) is highlighted, a move identifier area 320 presents a short description of the menu that will be presented if that icon is selected.

Prior to completing a transaction for purchase of a movie or other service, other applets are downloaded to the set top terminal which form menus stating the price of the selection, confirming the selection, showing a preview prior to purchase, and the like.

An illustrative set of particular menus used by the system are shown in FIGS. 9-19. These menus include: a help menu (FIG. 9) containing a list of help topics; a compass menu (FIG. 10) as discussed above; a movie information screen (MIS) (FIG. 11) containing a movie abstract as well as a preview button, buy button, "on set" button and help button; a movie preview screen (FIG. 12) containing a region for a video preview to be played, arrow buttons to next/previous preview, buy button, information (MIS) button and on set button; guarantee screen (FIG. 13); set

up menu (FIG. 14) containing fields for entering a rating limit,
a spending limit and a PIN as well as a save button and an on
set button; a list menu (FIG. 15) illustrating set up
information; an account summary screen (FIG. 16); an session
5   summary menu (FIG. 17) containing the active programs associated
with present PIN; a TV set up menu (FIG. 18); an alphabetical
listing menu (FIG. 19) as previously described. At the bottom
of each of the screens depicted in FIGS. 13-18 is printed an
example of the audio voice over (VO) that is reproduced as each
10   screen is displayed.

FIG. 5 depicts a schematic diagram of the contents of the
portion of an applet 500 that is transmitted via the information
channel to implement each of the menus. Separately, the
descriptor file is transmitted via the command channel (or
15   alternatively the information channel) such that the functions
of the applet can be implemented. A descriptor file for each
menu may be transmitted and stored (or prestored) in the set top
terminal. Specifically, the applet 500 contains a leader 502,
OSD overlay graphics 504, navigator control instructions 506,
20   transition signal 508, and compressed (e.g., MPEG) background
video 510. As such, upon selection of an icon in a given menu,
an applet for the linked menu is transmitted from server to the
set top terminal. That applet carries the background video and
the OSD overlays as well as all instructions necessary to
25   implement the functions of the menu. The video session manager
maintains the linked list (menu tree) of applet interrelations
such that when the set top terminal sends a command via the back
channel, the video session manager interprets the command and
causes the server to send the appropriate applet. The applet
30   begins with the leader 502 which is followed by the OSD
overlays 502 which are decoded by the OSD decoder while the
remainder of the applet is being processed. The navigation
control instructions 504 facilitate overlay activation and
transition control. The transition signal is generally a packet

that identifies the end of the navigator information and the
beginning of the new MPEG video. Lastly, the new MPEG video
signal is sent and presented in combination with the OSD
graphics. At some point in the menu structure, the subscriber
5   selects a movie title and the video session manager causes the
server to send the selected movie.

FIG. 6 depicts the appropriate alignment of FIGS. 6A and
6B. These figures, taken together, depict an applet
transmission and execution routine 600. The diagram depicts the
10   portion of the routine handled by the CPU on the left and the
portion of the routine handled by the OSD decoder on the right.
The CPU primarily handles control layer functions, while the OSD
decoder primarily handles graphics layer functions. The
routine 600 begins with step 602 and proceeds to step 604. The
15   CPU detects, at step 604, the type of transmission being
received. Specifically, the CPU detects whether the
transmission is a movie or a navigator applet. An applet is
identified by the video packet sequence containing a particular
stream identification code, e.g., VIDEO ID 7. If the
20   transmission is a movie, the video decoder begins, at step 606,
decoding the movie. The movie decoding process is controlled by
the CPU via step 656. At step 656, the CPU processes any movie
presentation control commands generated by the remote control.
As such, the CPU sends, at step 658, the presentation control
25   command to the video session manager to facilitate changing the
presentation. The routine ends at step 660.

If, at step 604, an applet is detected, the routine awaits,
at step 608, for the applet leader. At step 610 and 612, the
set top terminal CPU initializes the decoder and sets certain
30   buffer pointers. In particular, the applet contains a video
stream having VIDEO ID 7 carrying the OSD graphics, an audio
stream having AUDIO ID 7 carrying the applet control
instructions, and a video stream carrying the background video.
To process these applet components, the CPU must store the OSD

graphics and the instructions in special memory locations to avoid interference with the normal operation of the video decoder. As such, at steps 610 and 612, the CPU initializes the decoder's VIDEOID stream ID to 7 and sets the video stream

5 select (VSS) bit. The OSD data is delimited by a user packet that indicates that the OSD data download is complete. Further, the CPU sets a video input buffer pointer to an OSD region of the decoder DRAM. As such, all video packets having an ID of 7 are routed to the OSD region of the memory. Similarly, the set

10 top terminal CPU initializes the decoder AUDIOID stream ID to 7 and sets the audio stream select enable (ASE) bit. Also, the audio input buffer pointer is set to a temporary memory location of the decoder DRAM. This storage location is temporary because the instructions carried in the AUDIO ID 7 packets are

15 ultimately copied to the CPU DRAM for execution.

At step 616, the routine queries whether an excessive amount of time has elapsed between detection of an applet and reception of the applet. If the query is affirmatively answered, the set top terminal sends, at step 618, a negative

20 acknowledgment (NAQ) signal through the back channel to the video session manager. The routine ends at step 620. Upon receiving the NAQ signal, the video session manager will resend the applet.

If the query at step 616 is negatively answered, the

25 routine proceeds to step 622. At step 618, the set top terminal begins receiving the applet, i.e., the CPU detects the user data packet. At step 624, the routine queries whether an excessive amount of time has elapsed between detection of a user data packet and reception of the data. If the query is affirmatively

30 answered, the set top terminal sends, at step 626, a negative acknowledgment (NAQ) signal through the back channel to the video session manager. The routine ends at step 628. Upon receiving the NAQ signal, the video session manager will resend the applet.

At step 630, the control instructions within packets carrying AUDIOID 7 are extracted from the packets and stored in the CPU DRAM. At step 632, forward error correction is performed on the extracted bits. Additionally, at step 634, a

5   check sum is created to ensure that the extracted control instructions are correct. At step 636, the CPU queries whether the check sum was correct. If the check sum is correct, the routine proceeds to step 6342. However, if the query is negatively answered, the routine sends a NAQ to the video

10 session manager and ends at step 640 to await retransmission of the applet.

At step 642, the OSD data within packets having a VIDEOID 7 are extracted from the packets and stored in the OSD region of the decoder DRAM. The payload of these packets is one or more

15 bitmap images to be used by the applet. The OSD images are loaded directly into the start of the OSD data space. Subsequent packets (for VIDEOID 7) contain consecutive portions of the OSD image(s). An OSD image compiler leaves space at the beginning of each packet for actual MPEG synchronization codes.

20 To indicate the end of the OSD transmission, a "user data" packet of up to 96 bytes in length is inserted into the video stream between the OSD packet stream and the background video stream.

At step 644, the CPU resets the video decoder to enable it

25 to receive the background video transmission. At step 646, the video decoder begins to decode the background video and display that navigator imagery to the subscriber. The OSD overlays are also processed by the decoder and displayed in accordance with the descriptor file for the menu being displayed.

30 At step 648, the routine processes navigator commands from the remote control. These commands include all those associated with an applet with assets as well as an applet without assets. Note that an applet without assets has a single return button displayed for selection. Thus, the joystick is disabled, but

the select function operates in the same manner as an applet
with assets. At step 648, the CPU processes the three types of
navigator commands: local set top terminal commands such as
on/off, volume, channel selection; joystick directional vectors;
5   and region selection. The vectors are processed to determine
which region should next be highlighted. When a selection is
made, the CPU sends, at step 650, a command to the video session
manager to facilitate the transmission of a movie or applet.

At step 652, to facilitate a transition, the routine
10   freezes the background video and prepares the set top terminal
for the next applet or video transmission. In addition, the CPU
executes a latency masking process as disclosed in commonly
assigned United States patent application serial number
08/738,361 filed October 25, 1996. The applet ends at step 654.
15   Although many OSD graphics are sent within the VIDEOID 7
stream through the forward information channel, some OSD
graphics are transmitted to the set top terminal through the
command channel. Specifically, so-called "list screen" data is
sent through the command channel. This data contains a textual
20   list of characters to be used in a menu and is transmitted in
ASCII form at the beginning of an applet transmission. The CPU
converts the ASCII character list into OSD bitmap images and
stores those images for subsequent use.

FIG. 7 depicts a flow diagram of a list information
25   processing routine 700 for generating a list menu such as those
depicted in FIG. 4, 9, 15 and 19. The routine is executed by
the CPU upon requesting a list menu. The routine begins at
step 702 and proceeds to step 704. At step 704, the CPU
receives a list menu from the service provider. The menu applet
30   contains an instruction for the CPU to display page 0 of list
text that forms the menu. The list text an ASCII page of text.
The page 0 request is processed at step 706. At step 708, the
routine queries whether page 0 is available in the CPU cache.
If the query is negatively answered, the CPU requests the page 0

text from the service provider and awaits its arrival. If page
0 is available in the cache, the CPU retrieves and uses the
cached page to generate the text menu (at step 711). The CPU
converts the ASCII text into one or more OSD bitmap images using
5   an EEPROM based font and kerning table. The CPU stores the OSD
bitmap in the CPU DRAM. As the OSD lists are displayed, the CPU
moves the necessary OSD graphic images to the video decoder OSD
memory. The list menu is in the form of that shown in FIG. 4.
    Such display is performed on a paginated basis. At
10 step 712, the CPU monitors the remote control for a new
selection, e.g., up arrow, down arrow, and select a particular
region. If a down arrow is selected, the routine proceeds to
step 714. At step 714, the routine queries whether the display
is presently showing the last page of the list menu. If the
15 query is affirmatively answered, the routine returns to
step 712. If the query at step 714 is negatively answered, the
routine proceeds to step 716 to determine whether the next
subsequent page is cached. If the page is not cached, the CPU
requests, at step 718, the next page from the service provider.
20 The new page is used to form and display a list menu at step
719. Similarly, if an up arrow is selected, the routine checks
if the previous page is in cache. If the page is in cache, the
CPU uses the cached page. However, if the page is not
available, the CPU requests the service provider to send the
25 page.
    If, at step 712, the routine detects that a region other
than an up or down arrow is selected, the routine proceeds to
step 722. At step 724, the routine processes the region
selection in the same manner as described above for processing
30 and displaying a new menu that is identified by the region
selected. The routine ends at step 726.
    The method and apparatus of the present invention provide
an interactive menu structure (navigator) for an information
distribution system such as a video-on-demand system. The

navigator provides an enjoyable, interactive experience with full motion background video and active graphics that indicate when a selection is made by altering their appearance. All this functionality is brought to the set top terminal within an

5   applet for each displayed menu. Consequently, the set top terminal does not require an expensive processor nor a large amount of memory. As such, the invention allows the set top terminal in an information distribution system to remain relatively inexpensive.

10   Although various embodiments which incorporate the teachings of the present invention have been shown and described in detail herein, those skilled in the art can readily devise many other varied embodiments that still incorporate these teachings.